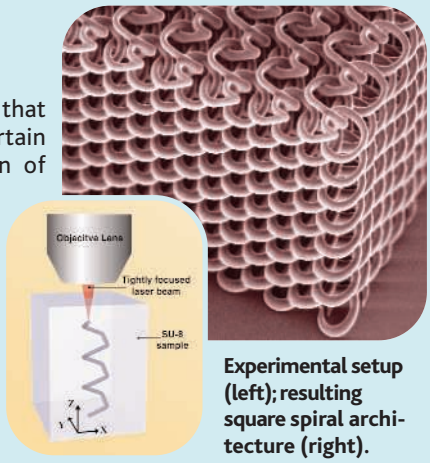
EDITORS' CHOICE

edited by Stella Hurtley

MATERIALS SCIENCE

Spiral Photonic Crystals



Experimental setup (left); resulting square spiral architecture (right).

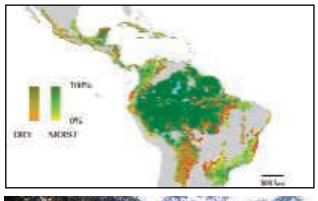
Photonic crystals are periodic dielectric structures that have a band gap that stops the propagation of a certain frequency range of light. Through the inclusion of defects or cavities, photonic crystals can be designed to trap or guide light and are thus of considerable interest for use in optics and communications. Three-dimensional photonic crystals have been designed from theory, but most have a complex structure that cannot be fabricated using traditional layer-by-layer approaches. Seet *et al.* use direct laser writing to fabricate circular and square spiral architecture structures. The process works through the curing or hardening of a polymeric photoresist as it absorbs multiple photons from a tightly focused laser beam. In previous systems, a liquid photoresist has been used, but because of shrinkage that occurs on curing, this method limits the resolution that can be obtained. The photoresist SU-8, by contrast, is solid both before and after processing and undergoes only small refractive index and density changes upon curing, making the writing process more uniform. Because of the self-supporting nature of the material, complex defect structures could be engineered into the periodic crystals. — MSL

Adv. Mater. **17**, 541 (2005).

ECOLOGY/EVOLUTION

Preserving the Reserves

Protected areas of tropical forests harbor some of the greatest concentrations of terrestrial biodiversity, and the maintenance of this wealth depends in part on the integrity of the surrounding unprotected habitat. The effectiveness of protected areas for conservation of ecosystems and biodiversity is a continual source of anxiety for conservationists, especially when such areas are remote and difficult to monitor. Using satellite data, DeFries *et al.* have completed a global assessment of the extent of forest loss within and around nearly 200 protected areas in the tropics over the past 20 years. The capacity of surrounding buffer zones to enhance the effective size of protected areas has diminished in most cases over this period, and there has been a near-universal trend toward increasing isolation of protected areas. This trend has been especially sharp in Asian tropics and in dry tropical forests, where the protected areas themselves have often suffered habitat loss. As the surrounding areas become decreasingly effective as buffer zones, the management of protected areas will need to focus more sharply on the ecological interactions at the boundary if biodiversity is not to be further eroded. — AMS



Logging in the tropics (bottom); forestation decline (red) in Latin America (top).

Ecol. App. **15**, 19 (2005).

CELL BIOLOGY

Reversing the Signs of Aging

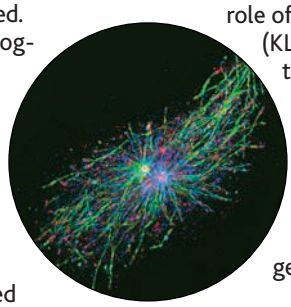
Progeria is a devastating disease in which the normal processes of aging appear to be alarmingly accelerated. Hutchinson-Gilford progeria is caused by a mutation in one of the nuclear lamin genes that leads to the production of a truncated form of lamin A (De Sandre-Giovannoli *et al.*, *Science* 27 June 2003, p. 2055; published online 17 April 2003). Nuclear lamins line the inner nuclear membrane and help to maintain nuclear integrity. Cells taken from progeric patients display nuclear abnormalities, including severe morphological defects in the nuclear envelope. Now Scaffidi and Misteli show that simple expression of wild-type lamin does not rescue this cellular phenotype. Instead, suppressing the expression of the mutant lamin "cures" the nuclear envelope defects and concomitantly other defects, such as those in histone modification, are rescued—effectively reversing the cellular aging process. These findings may provide an avenue of hope for potential therapies aimed at this distressing, though extremely rare, condition. In addition, detailed understanding of the cellular aging process will be important in helping to combat the symptoms of aging in the general population. — SMH

Nature Med. **7**, 235 (2005).

CELL BIOLOGY

Division of Labor

Eukaryotic cells contain a dynamic array of cytoskeletal elements—microtubules—that organize key events in the cell's life cycle, including cell division. The regulation of microtubule polymerization and depolymerization, processes that both occur at the so-called plus ends of microtubules, must therefore be carefully controlled. Mennella *et al.* looked at the role of two kinesins (KLPs) and how they cooperate to control appropriate microtubule dynamics. KLP10A targeted microtubules via the microtubule plus-end tracking protein EB1 and stimulated microtubule catastrophe—a process in which a growing microtubule suddenly changes its behavior and shrinks rapidly. KLP59C also stimulated microtubule depolymerization, but by sup-



Motor protein KLP10A (red) follows EB1 (blue) to the ends of a subset of microtubules (green).

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CREDITS: (TOP) SEET *ET AL.*, *ADV. MATER.* **17**, 541 (2005); (BOTTOM LEFT) DEFRIES *ET AL.*, *ECOL. APP.* **15**, 19 (2005); (BOTTOM RIGHT) MENNELLA *ET AL.*, *NATURE CELL BIOL.* **7**, 235 (2005)

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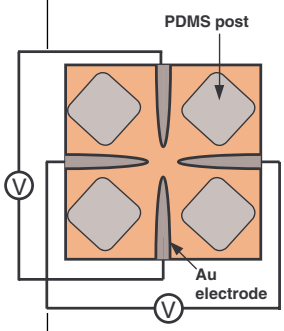
pressing a process termed rescue—when the behavior of a shrinking microtubule is converted to growth. Both motors were found at the plus ends of distinct subpopulations of microtubules (KLP10A on polymerizing microtubules and KLP59C on depolymerizing microtubule). Thus, there appears to be a division of labor within cells between these two molecular motors to locally control microtubule dynamics. — SMH

Nature Cell Biol. **7**, 235 (2005).

APPLIED PHYSICS

Canceling Brownian Motion

One problem in trapping small particles or cells in solution for further study is the ever-present jostling caused by Brownian motion. Cohen and Moerner have developed an anti-Brownian electrophoretic, or ABEL, trap that cancels Brownian motion. Particle movement was followed via fluorescence microscopy. Images were acquired and processed in real time, and the resulting analysis was used to apply voltages to a set of four electrodes, which create a gap of 10 to 15 μm around the particle. The applied electric fields create electrophoretic drift that cancels Brownian motion in the plane. Excursions of polystyrene nanospheres of more than 5 μm from the center of the trap were rare. — PDS



ABEL trap.

CREDIT: COHEN AND MOERNER, *APPL. PHYS. LETT.* **86**, 093109 (2005)

Appl. Phys. Lett. **86**, 093109 (2005).

GEOLOGY

On Top of the World

The Himalayas and Tibet now have Earth's highest elevation, approaching 5 km above sea level on average, but it has been unclear how long this has been the case. One hypothesis is that within the past 5 to 10 million years, the dense lower crust and upper mantle of Tibet have detached and sunk, allowing an influx of hotter, less dense mantle that produced rapid uplift in this region. Some recent evidence based on elevation ranges of fossil plants, however, has implied that elevations were already high 15 to 20 million years ago. Currie *et al.* used a different approach to determine paleoelevations—the oxygen isotopes in carbonate minerals deposited in ancient lakes on the leeward (northern) side of the Himalayas. The basic idea is that as air masses encounter mountains, they rise, producing rain and snow, which decreases the $^{18}O/^{16}O$ ratio of water vapor in the air mass. Higher mountains lead to further reductions in this ratio. The data from the ancient lakes are consistent with the plant fossil data and imply that the Himalayas have been about 5 km high for about 15 to 20 million years. Although a detached slab of crust is not ruled out, their high uplift may require another explanation. — BH

Geology **33**, 181 (2005)

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

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It Takes Two

The prevailing model of olfaction is that individual neurons express only one odorant receptor (OR). Goldman *et al.* challenge this view by finding that one olfactory receptor neuron (ORN) in the *Drosophila* sensilla in the maxillary palp (a fly olfaction organ) expresses two highly divergent *Or* genes. Seven *Or* genes were expressed in the six types of neurons found in maxillary palp sensilla. In a receptor-to-neuron map of the ORNs in the maxillary palp, three *Or* genes were expressed in the pb2 class of sensilla. Each class of sensilla consists of an A- and a -B type neuron. To determine if the genes were expressed in the A or B neuron, the Or-specific promoters were used to express the proapoptic protein Reaper, causing selective cell death in only one of the two neurons. When *Or33c* or *Or85e* promoters were used, the surviving neuron was pb2B. Thus, both Or33c and Or85e appear to be expressed in the pb2A neuron. Or85e and Or33c transcripts were present in the same ORN in three different species of fly. The combined receptors may be specific for unidentified odorants, potentially increasing further the complexity and specificity of odorant perception. — NG

Neuron **45**, 661 (2005).

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